BIRD229: [AMI Test Configuration] – Standardizing Algorithmic Model Testing

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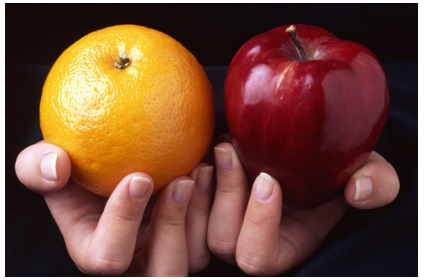
Agenda

- Why AMI Test Definitions Are Needed
- Enabling Automated Testing - BIRD229: [AMI Test Configuration]
  - What Does It Include?
  - Where Is it In An IBIS File?
- The Ideal Use Case
- Potential Issues
  - Text data precision
  - File size
  - BCI support? Repeater support?
- Next Steps
- References

Why AMI Test Definitions Are Needed



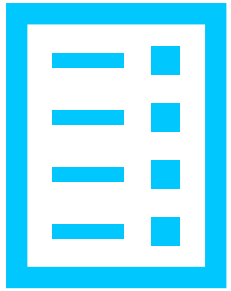
- A model-maker's environment may differ from a user's
  - Operating system, system architecture, tool interface can cause variations
  - Channel processing does differ between tools – a separate problem
  - Some parameters outside .ami files can affect results (e.g., sampling)
- Some requirements for compatibility are still hard to check
  - Root name, parameter string format issues can affect or stop simulation

```
(sr_ddr5_rx(Modulation "NRZ")(VGA(Gain 0))(DFECDR(PhaseOffset 0)))
```

Some parser checks (e.g., BUG227) cannot be completed without having very specific test setup information

BIRD229 – [AMI Test Configuration]

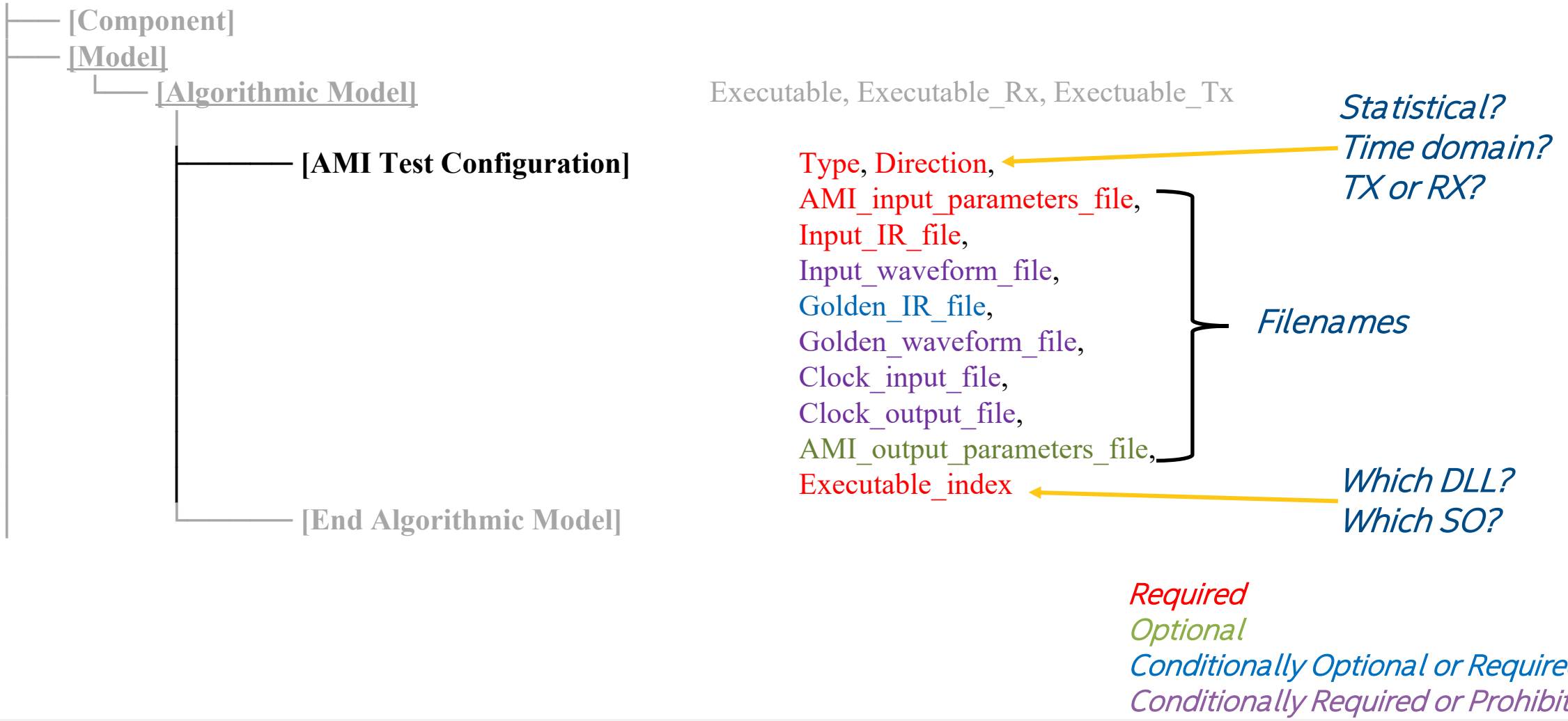
- A new, proposed keyword defining a specific set of test conditions and inputs with expected outputs for a specific model
- The keyword's subparameters are mostly local filenames…
  - Input impulse responses or bit patterns
  - Input parameters (including ones outside the .ami file's contents)
  - Expected output parameters and impulse responses or waveforms



- … plus direction, statistical or time-domain, and executable index

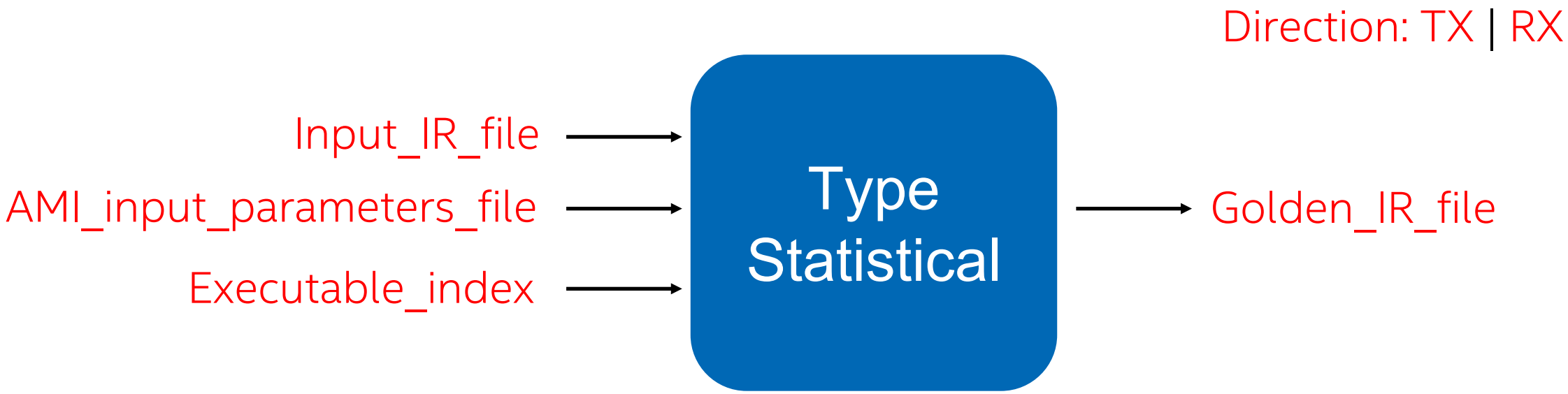
See the specifics at https://ibis.org/birds/bird229.docx

[AMI Test Configuration] - Where is it?



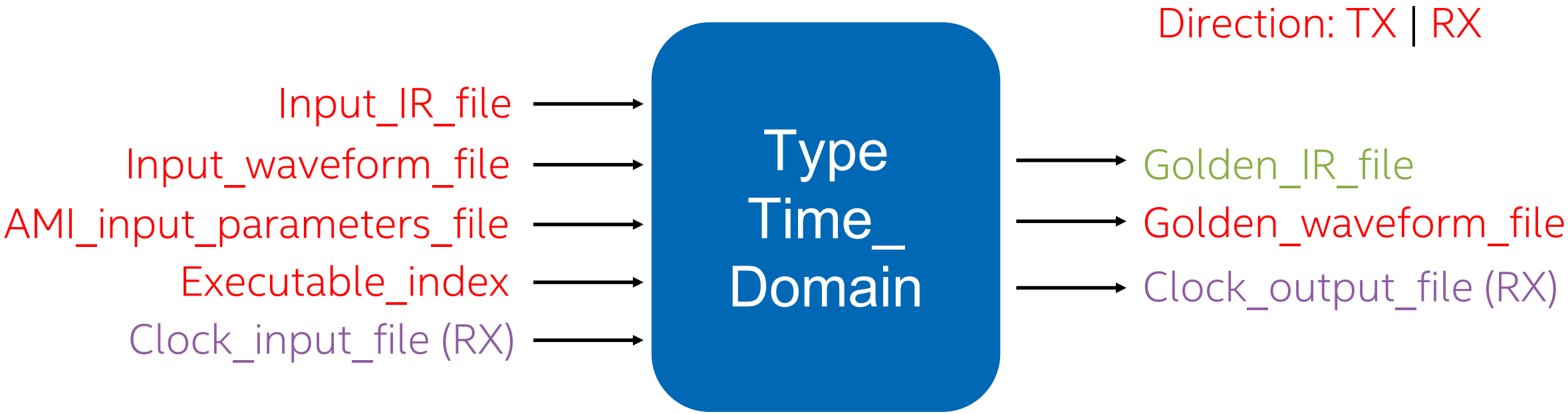
Statistical Model Requirements

- A single AMI model only is being tested here
  - No channel, no analog models, no other devices



Time-Domain Requirements

- A single AMI model only is being tested here
  - No channel, no analog models, no other devices



What Do These Text Files Include

File	Purpose	Content
AMI_input_parameters_file	Define specific AMI In and/or InOut parameter settings to use AND function call settings	(see example on next slide)
Input_IR_file	Define input impulse response	One or more vectors of impulse voltage data, depending on crosstalk
Input_waveform_file	Define input time-domain response	A single vector of analog waveform voltage values
Golden_IR_file	Define expected output impulse response	One or more vectors of filtered impulse voltage data, depending on crosstalk
Golden_waveform_file	Define expected output Time-Domain response	A single vector of analog waveform voltage values
Clock_input_file	Define input clock data for Time-Domain Rx models where Rx_Use_Clock_Input is used	A single vector of clock time or waveform data
Clock_output_file	Define output clock data for Time-Domain Rx models	A single vector of clock time or waveform data
AMI_output_parameters_file	Define expected Out and/or InOut parameters	Root name and list of all Out and/or InOut values; list repeats for each Time-Domain block

AMI Input Parameters File

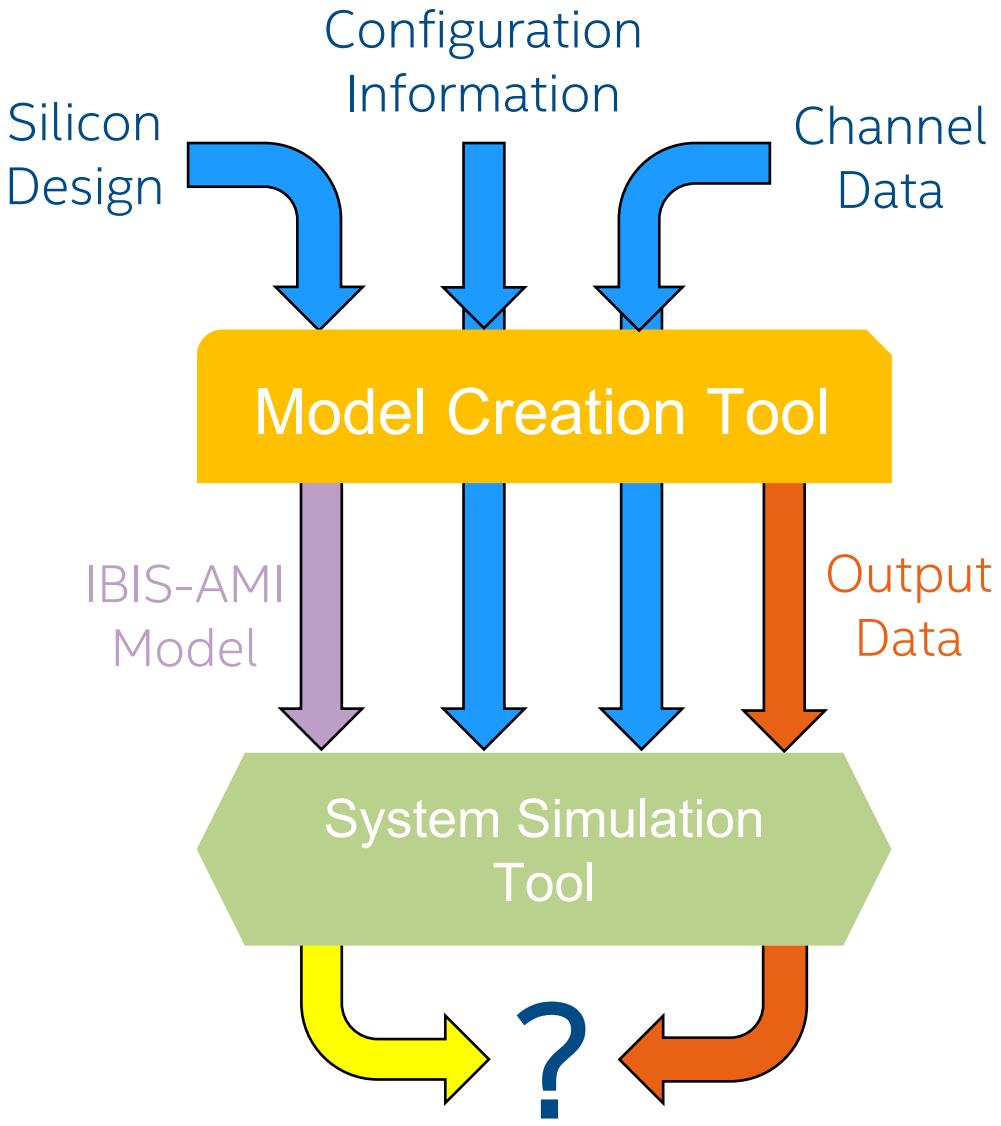
```
(Simulator_parameters
        (Sample_interval <float>)
        (Symbol_time <float>)
        (Number_of_rows <integer>)
        (Aggressors <integer>)
)
(Model_parameters
        (<root name>
                (<Usage In or InOut parameter name> <value>)
                (<Usage In or InOut parameter name> <value>)
                (<Usage In or InOut parameter name> <value>)
                …
        )
)
```

Additional configuration information usually defined in the AMI_Init and AMI_GetWave function calls

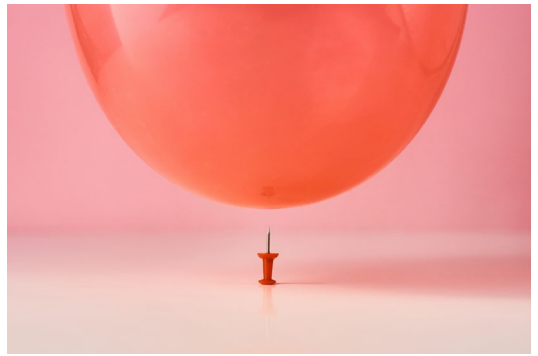
Traditional .ami file parameters, with values specific to the simulation case being defined

The Ideal Use Case

- Generation of the data should be easily automated as part of model creation
  - Keyword documents a test case
  - Keyword also contains the channel information
- Testing of the model against the data should also be “push-button”
  - EDA tool simulates the given configuration
  - Enables automatic generation of comparison report versus output in the keyword



Potential Issues



- Precision is not defined for the output
  - Quality of correlation between provided and simulated data may be affected
- File sizes may be very large for waveform data
  - Depends on number of bits involved; binary format needed?
- BCI and repeater support are not explicitly defined
  - Repeaters should have their RX and TX models treated independently
  - BCI involves multiple devices; BCI_State should be assumed “Off”

Next Steps

- Examples are posted to GitHub!
  - Also available on IBIS ATM Task Group reflector
  - These include .ami and DLL files from 2008/2009 AMI test kits

- Expect a separate BIRD related to channel characterization later this year
  - Likely an extension of [Test Load]/[Test Data] for AMI

Please examine BIRD229 and provide feedback when possible!

For More Information

- BIRD229: https://ibis.org/birds/bird229.docx

- GitHub IBIS Repository with Examples
  - https://github.com/IBIS-Library/BIRD-examples/
  - Look for “229-AMI-Test-Configuration”

- IBIS ATM Task Group Reflector
  - https://www.freelists.org/archive/ibis-macro/

Thank you!